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Ethical Issues at the University-Industry Interface: a Way Forward?

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Abstract

This paper forms an introduction to this issue, the contents of which arose directly or indirectly from a conference in May 2001 on Corruption of scientific integrity? - The commercialisation of academic science. *The introduction, in recent decades, of business culture and values into universities and research institutions is incompatible with the openness which scientific, and all academic pursuit traditionally require. It has given rise to a web of problems over intellectual property and conflict of interest which has even led to corporate sponsors' suppressing unfavourable results of clinical trials, to the detriment of patients' health. Although there are those who see the norms of science developing to recognise the importance of instrumental science aiming at specific goals and of knowledge judged by its value in a context of application, none justifies the covert manipulation of results by vested interest.*

Public awareness of these problems is growing and creating a climate of opinion where they may be addressed. We suggest that a way forward by the introduction of nationally and internationally-accepted guidelines for industrial collaboration which contain proper protections of the core purposes of universities and of the independence of their research. Some codes suggested for this purpose are discussed. We note that some universities are moving to adopt such codes of conduct, but argue the need for strong support from the government through its funding bodies.

Keywords: codes of conduct; conflict of interest; declaration of interest; IPR; public interest; scientific misconduct.

Problems at the University-Industry Interface

In May 2001 the Council for Academic Autonomy and the Council for Academic Freedom and Academic Standards organised a conference on *Corruption of scientific integrity? - The commercialisation of academic science* at the British Academy in London. The core papers in this special issue of *Science and Engineering Ethics* [1-4] derive from this conference. The other papers have been selected to complement and develop the issues discussed there.

The problems on which the conference focused have not gone away. In the intervening period scientific journals and the press have carried story after story about the difficulties which arise when there is neither barrier nor required etiquette to keep a proper distance between the conducting (and reporting) of scientific research, and its funding.

Universities, research councils and scientific journals, have traditionally seen themselves as the guardians of integrity in scientific research. The stamp of their approval was taken as evidence, not only of the quality of the work, but also of its honesty. That scene

is now much more complex. Hard-up universities, driven by prospect of financial gain, are repeatedly tempted to accept questionable arrangements with industry because they are perceived to be essential to survival [cf. 5, 6]. With Government encouragement, the research councils have on their selection panels representatives from industry and commerce, and support a myriad of schemes encouraging collaborative work between university and industry. The industrial partner often has control over publication of the results of such collaborative projects. Scientific journals, with weak or non-existent conflict of interest policies, have published work biased by the financial interests of the authors or of their sponsors. Further, the regulators, such as the Higher Education Funding Councils, which fund the infrastructure in the UK, are not allowed by their terms of reference to be robust unless there is a significant failure of compliance with their financial memoranda. The House of Commons Select Committee on Health spoke reprovingly of the work of the Health Policy and Health Services Research Unit at University College, London, which had been analysing the effect of the private finance initiative on the NHS [7]. Those with critical comment which conflicts with Government objectives may find it difficult to get a hearing in Government.

Several papers in this issue show that the situation in pharmaceutical and medical research is especially serious. This was put bluntly in a recent *Lancet* editorial on "Pharmaceutical industry and medical research"[8]:

> *"[E]conomic pressures are creating an environment in which the pharmaceutical industry, which often sponsors medical research, exerts control over trial design, access to raw data, and interpretation of study findings. A serious concern is that research sponsors may influence decisions as to how trials are published and promoted (if the results are favourable to the sponsor), or obscured (if unfavourable)."*

Pervasive effects

Academic scientists everywhere – and there are several examples in the papers in this issue - tell stories of the consequences to themselves and to their work. These are often anecdotal, full of the personal frustrations and bewilderment of scientists forced to choose between accepting direction or control of the publication of results and leaving the research field, perhaps giving up research altogether. These problems are not confined to newly-established universities and to those with little or no endowment income, as is demonstrated by the following examples which concern the University of Cambridge.

Intellectual property

The first example relates to the ownership of intellectual property. Ownership of scientific ideas and the results of research used to be relatively straightforward. Universities who employed academic researchers could in theory lay claim to the copyright, but they did not normally do so. It was not as though a great deal of money was usually involved and the scientist remained free to discuss his work with others at conferences and to work collaboratively with those in other universities in or outside the UK. The comparative lack of secrecy made harder both plagiarism and the suppression of unwelcome results. But now a lot of money may be involved, both in investment and in the prospects of profit.

Cambridge's changing stance on intellectual property graphically illustrates the trends and the dangers. In 1987 it established its first formal policy on intellectual property rights, relating solely to IPR arising from Research Council (and therefore publicly) funded work. Inventors of something which might prove exploitable were "invited" to assign their rights in the intellectual property to the University "in return for an equitable share of the profits of exploitation". The inventor and the University would then exchange contracts and the rights

were assigned to the University company known as "Lynxvale": the University did not hold patents itself. (This was a device designed to protect the University's status as an educational charity). By March 2000, the University had created a Research Services Division. On 31 January 2001 a Report was published in the *Cambridge University Reporter* "On the ownership of intellectual property rights generated by externally funded research". The University now had a nominee company, Cambridge University Technical Services Ltd., replacing Lynxvale (which had by now spawned a long list of companies).

The category of research affected was now widened to include all "externally funded research". The University asserted its right to claim ownership of copyright where work was "commissioned" and to "establish alternative arrangements with other external funding bodies such as companies or charities that may wish to establish their own joint or sole ownership of and IPR generated from the research". There are at the time of writing moves for the University to attempt to claim copyright of all non-fiction publications including books. There was lack of clarity here because researchers working on external funding were often using University laboratories and collaborating with other researchers paid only by the University. The relatively tidy requirement in the case of Research Council funding, that the University should undertake to provide the necessary "infrastructure", was not always formalised.

For example, Glaxo had for a time an embedded laboratory in the Pharmacology Department, an arrangement inevitably denying Cambridge's own scientists bench-space in the HEFCE-funded infrastructure so as to make room for the commercial cuckoo in the Departmental nest. And Cambridge did not always know how many commercial enterprises were using its academic laboratory space, for no central record was required to be kept.

Conflicts of interest

There is often great confusion about conflict of interests. For example, the Cambridge Network was set up as company formed from local businessmen and business interests. Sir Alec Broers, the Vice-Chancellor of Cambridge, acting in a personal capacity, had been asked to chair the group [9]. That was not how the Cambridge Network understood the position. It said, in answer to a telephone enquiry from one of the present editors that its Chairman was acting in his capacity as Vice-Chancellor. On his Declaration of Interests list the Vice-Chancellor appeared merely as a "Director". There appeared to be no record within the University of any formal process of decision-making when the Network was set up in 1998 so as to ensure that the University did not enter into a relationship with it which could compromise its charitable status. The Finance Committee file on the Network started only in 1999. There appeared to be no answer to the question "in what capacity the University is a member".

Meanwhile the Vice-Chancellor held a non-executive directorship of Vodafone, for which he was paid £65,000 in the last financial year, and while he held that position, in October 2000 Vodafone announced that it was going to give "free" Vodafones to Cambridge students, in return for their doing some research and development. The *Cambridge Evening News* ran the story on 10 October (the *THES* ran the story too). The Vice-Chancellor's "vision" was said to be "to use the best and freshest brains in the country to come up with applications for the next generation of mobile phones". Vodafone's "strategy director" was quoted as saying, "This is a pioneering investment in Cambridge". "Millions of pounds will be going into the city over the next few months". There was, again, no apparent clarity about the conflict of interest involved. Some colleges began offering free Vodafones with their Visa cards. One day in King's Parade a bunch of red Vodafone balloons was visible, held by their strings by a Vodafone publicity person.

Declarations of interests there were, though not as many as the HEFCE auditors would have liked to see. In 1999 Broers was already a man of many interests, many of them harmless presidencies of Cambridge projects and societies. His list of declarations of interest did not separate the personal interests from the "Vice-Chancellarial". A number were clearly personal, such as his non-executive directorship of Vodafone. For others, it was impossible to say at first glance. American University of Sharjahm, member of Board of Trustees? British Aerospace Virtual University Strategy Board, Member? Engineering and Physical Sciences Research Council, Member? London Goodenough Trust for Overseas Graduates, Governor? Malaysian British Business Council, Member? Malaysian Multimedia Super-Corridor, Member of International Advisory Panel? Singapore, International Academic Advisory Panel, Member?

It is not evident from this list of 1999 (or that of any other year) that a careful eye was being kept on the balance of the Vice-Chancellor's involvements, so that he might not be thought to be in the pocket of any particular interest group or of any particular government, in the UK or abroad. Nor was it clear that Broers was keeping himself apart from party-political or government involvement. Membership of the Prime Minister's Council on Science and Technology was bound to raise an eyebrow when Gordon Brown as Chancellor of the Exchequer gave £68M to Cambridge and MIT to set up what became CMI Ltd., without competitive tenders or any opportunity for any other University to be considered.

Corporate giants looked approvingly on the Cambridge-MIT scene at the beginning of the project. The Chief Executive of BP Amoco was a "supporter". Cambridge has a BP Institute, with a Professor and a Director known as the BP Amoco Director, and the BP's Chief Executive vociferously approved "this partnership". In 2001 BP faced two shareholder resolutions questioning its corporate conduct, one on climate change, the other on human rights issues in Tibet and Sudan. Cambridge University was left exposed because of its lack of a policy on ethical questions arising in connection with its corporate associations. Another comment, linking the Government with BP, came from Lord Simon of Highbury, former minister and Chairman of BP, and at that time adviser to the Cabinet Office. He described the CMI project as "a brilliant concept for an educational alliance" which would encourage breakthroughs in entrepreneurship and new technology applications. Then came the Chairman of Glaxo Wellcome, with "This is very good news for academia, for business and for the UK". Glaxo had the Glaxo Institute of Applied Pharmacology in Cambridge. Next was Chris Gent, Chief Executive of Vodafone Airtouch, with "This is a very exciting collaboration". Lord Simpson, Chief Executive of GEC, commented that "The new knowledge-driven industries, like Marconi, depend heavily on getting the right people with the right skills". Marconi was doing that directly through its own partnership arrangement with Cambridge as a major funder of buildings and research before its dramatic market collapse. Alex Trotman, former Chief Executive of Ford Motor Company, was also "delighted" by the CMI development. He was to become the Chairman of the CMI Ltd Board of Directors.

These are instances – though not unimportant ones - of the problems which may be generated in the rush to form relationships and partnerships between industrial and commercial interests and those of academe.

The business culture take-over

These changes indicate the extent to which government policies are radically changing the structure and values of higher education with consequences for the integrity of research. It is appropriate to ask how this has come about and what is driving it. These policies are often justified in terms of the need to improve economic performance, or to adjust to the requirements of a mass system of higher education. However, as Mary Tasker and David

Packham have argued [10], the origin of such policies on higher education can be seen as deeply rooted in Neo-Liberal ideology. Its aversion to publicly-supported higher education was manifest as long ago. The Mont Pèlerin Society was founded by Hayek in 1947 to preserve "freedom" by means of establishing "free market" dominance across the world [11]. Its early proceedings complained of "institutions which run at a loss, nationalised industries supported by the treasury, colleges dependent on grants and subsidies" [12].

More recently, Robert Berdahl, Chancellor of the University of California, Berkeley, has described the "extremely clever and effective political campaign" by conservative political and business interests in the United States as an "assault" aimed at undermining the capacity of universities to provide independent expertise and critique by (among other things) "stimulating the growth of the university-industrial complex" [13, 14].

Last year, the U.K. Higher Education Minister, Margaret Hodge praised Vice-Chancellors for "their excellent work in leading and managing their businesses" [15]. Corporate language has become the fashion in higher education. Ministers constantly refer to the knowledge economy and the need to encourage “entrepreneurial universities”[15]. The language used is profoundly significant. Victor Klemperer relates how the Nazis used the power of language as a political tool in order to shape society [16]. Orwell recognised that those who wish to change attitudes will often seek to encourage particular forms of language and characteristic vocabulary, recognising that changing language is a major step on the path to changing attitudes and culture [17]. This linguistic colonisation, rife in contemporary education, is no innocent foible [10, 18].

There are two significant questions here. The first concerns the degree to which those who acquiesced in this change were conscious of its significance, and, the second whether they foresaw the full extent of the impact it would have on the very idea of a university.

The effect on the idea of a university

It must be apparent that the editors are writing from the perspectives of the traditional norms of science and of the culture and values of the liberal university. From this perspective, the influx of business culture with the attendant problems, which feature in this volume, certainly cause serious ethical difficulties [6]. However do they remain problems and difficulties to those in universities who may espouse the values and culture of business and industry? Milton Friedman has argued that the limits of the social responsibility of industrial corporations are "to make as much money for their stockholders as possible" [19]. Subject to the law, this makes it imperative to "go for profit". If this means suppressing inconvenient information, silencing or sacking an employee who is a critic, un-cooperative or even suspected of lack of loyalty, then many university leaders now ask "why not?". Such values are plainly incompatible with the disinterested pursuit of truth and with the norms of science as expressed by Merton - universalism, communalism, disinterestedness and organised scepticism [1, 20]. As John McMurtry commented, such economic determination of education "must entail, ex hypothesi, the systematic negation of [widely accepted] educational goals and standards" [18]. It is far from clear that many in universities who adopt the language and values of the business have thought through the full consequences of their position.

The traditional values of the university are simply not compatible with those of industry and commerce, but what if, as some argue, the traditional values are anachronistic, no longer valid in the postmodern world with its mistrust of meta-narratives. This point is discussed elsewhere in this volume [21], where it is argued that an education which took postmodernism seriously would actually be "more subversive of industrial interests" than one based on traditional values. The present editors would respond that the university has a vital

social function of speaking the truth fearlessly, which governments may not like, but which is essential to the preservation of a free society.

Developing perceptions of science

In a similar way, there are those who question whether the traditional view of disinterested science is still valid in the global market economy with its commercialisation of knowledge.

John Ziman [1] discusses the importance of "instrumental science" which aims at specific goals which may produce "intellectual property", the value of which can only be preserved by being kept secret. Peter Scott expounds the concept of "Mode 2" knowledge, produced in the context of application [22]. It is deemed "knowledge" if it is useful to someone - e.g. industry, government or society at large. In their different ways both Ziman and Scott argue for a re-evaluation - or certainly an extension - of the traditional ("Merton's norms") perception of science. Weatherall on a pragmatic level argues that the cost of much research - he is thinking especially of medical research - is now so enormous that publicly funded universities could never hope to have the necessary resources [3].

This is not the place for a detailed analysis of the relationship between a traditional liberal idea of a university and of science and the ideas discussed by Ziman, Scott and Weatherall. One purpose of the present volume is to prompt that analysis by raising awareness. However it is important to note that the problems highlighted in this issue - suppression of results, endangering human health and even life, deliberate deceit are anathema under all of these paradigms. They are not merely concerns of a "dated" scholarly ethos. For example, Ziman insists that reliable knowledge is required "for a variety of public purposes, such as political discourse, legal disputation, and consumer protection". At present, as the papers in this issue demonstrate, such knowledge is often perceived as, and often is contaminated by, covert manipulation by vested interest. Partial results are dressed up as objective knowledge.

The ethical problems therefore remain. A contemporary university and its leadership are often ill-equipped, perhaps even disinclined, to stand up to the resulting pressure or to protect effectively the intellectual independence and integrity of its scientists. It is one of the lessons of the Conference and of this volume that scientists need the protection of clear-headed and fearless university leaders, who understand how important that is, and are resistant to being bought or intimidated.

The triggers of change

There are, however, promising shifts of perception and expectation as the world wakes up to the negative effects of what has happened.

Media interest is strong. The effect of press exposure is far from negligible. The steady stream of stories suggesting that the integrity of the scientific process and the reliability of results is being called into question has a sufficient worrying effect on the general population to have made it difficult for Monsanto (for example) to achieve a ready market for genetically modified seed in Europe. In August 2002 an African nation rejected genetically modified food aid even when its population was starving. George Monbiot, one of the authors represented in this volume, has written article after article on the linked themes of this book [v. 23]. People are uneasy, and uneasy consumers are not good news in the corporate board room.

In 1994 *Nature* reported work which, quite properly, caused unease[24]. It concerned BST, Bovine Somatotrophin, which substantially increases the milk yield of dairy cows. A recent estimate suggests that Monsanto and several other firms, including Eli Lilly, Upjohn

and Cyanamid, have spent approximately £700 million on developing the drug. There are some data indicating health risks to humans caused by use of BST, but they are at present too sparse to justify intervention by the regulatory authorities. In *Nature* Erik Millstone, Erik Brunner and Ian White tell a story of blockage and evasion as they tried to bring together the evidence from various sources, and publish an analysis of its implications. A paper was submitted to *Veterinary Record* which would publish it only with the consent of Monsanto. This was withheld on the grounds that the researchers who had produced the data analysed in the paper must be allowed to publish first. There followed a tale of attempts to arrange simultaneous publication to stimulate debate and of stop-start decisions involving more than one journal. "Monsanto's legal rights over the raw data are unambiguous," comment the authors, but the issue of rights concerning analyses of their data appears to be a grey area, even when the use of the data and its source is acknowledged.

The paper by David Healy in this issue describes an example of the powerfulness of the vested interests in discouraging independent criticism of drugs in whose development there has been vast financial investment [25]. Nancy Olivieri's story provides another example [2]. Healy has been able to bring to light a further case. A suicide by a patient on the antidepressant paroxetine before which he murdered three members of his family, led to successful litigation by the patient's family against GlaxoSmithKline in 2001. As an expert witness, David Healy was allowed access to company documents, including records of early trials of the drug. His testimony revealed that those trials showed the sort of side-effects of agitation and attempted suicide which had been fatal in this case [26]. Yet the documentary evidence is still being withheld from public scrutiny by the company, on grounds of "patient confidentiality" (not a barrier to the presenting of the results of "successful" trials), and an unwillingness to give out raw data. So the dangers of secrecy are not going unnoticed.

The collapse of corporate credibility: a new development

There is a significant new development since our conference of 2001, and that is the collapse of corporate credibility. The big corporations have ridden out many of the embarrassing revelations, but their fall from grace in the public eye for fraud and managerial manipulation (for example, Enron, Worldcom and Kozlowski of Tyco International) is now making that more difficult. It is not reassuring to be told that the science is fine and there is nothing to worry about by a corporation whose morals are suspect. And at present the morals of all corporations are becoming suspect because of the growing public realisation that there have been certain common features in their conduct of their affairs.

Some of the big corporations are now in disgrace. Profit has been the end justifying the means. In the words of the *Sunday Times,* "Last week America endorsed new rules for accounting and corporate governance. ...It is as if the 1930s are being played all over again. Then, as now, the politicians stepped in, desperate to win back voters' confidence. Now the drama is being played out on television to an audience that has been told for decades it should invest in America Inc only to find it was being run by crooks." [27]

This comment makes a Cambridge University press release of September 2001 particularly striking. "The aim is to align as nearly as possible the interests of individuals, corporations and society. The incentive to corporations is to achieve their corporate aims and to attract investment. The incentive for states is to strengthen their economics and discourage fraud and mismanagement" (Sir Adrian Cadbury's definition of "corporate governance"). There is a heavy irony in this particular example, since the purpose of the press release was to announce a new Chair in Corporate Governance at the Judge Institute of Management Studies in Cambridge. The Chair was funded by a gift of 4 million dollars from Dennis Kozlowski of Tyco, whose affairs were being investigated by the American courts in 2002,

when he was accused of tax fraud (evading more than $1m in New York sales tax and tampering with evidence). Yet a Notice on "Ethical guidelines on the acceptance of benefactions" was published in the *Cambridge University Reporter* in October 2001 which said: "In the case of unproven allegations of criminality against a potential donor, no account shall be taken of mere rumour, but care will be exercised in accepting any benefaction, or continuing negotiations towards a possible benefaction, where there is a risk of significant damage to the University's reputation". The University continued to be reluctant to act on its own guidelines and hand the money back. The broadsheets ran the story in November 2002, causing significant damage to the University's reputation. [See too 28]

If it is difficult even for a University to stand by its published ethical principles, it is much more difficult, and consequently rare for an individual to take a principled stand. Nancy Olivieri did so, and the story of what happened to her and her work may be read in this volume.

A way forward - nationally and internationally-accepted guidelines?

What can be done? One of us has recently addressed this question [29]. Here we develop and reformulate the argument in the light of the discussion presented at the Conference and in the papers in this volume.

It would not be impossible to set up a structure containing proper protections of the core purposes of universities and of the independence of their research. This would, first, the creation of an agreed code of good practice; secondly, its policing.

In 1997 Packham and Tasker made a list which might form the basis of a code, derived from the experience of Yale, Harvard and other institutions [30]. It is regrouped here, under three heads. (i) Intellectual freedom. The university must insist that there is to be no restriction on the freedom of inquiry of their academics, or their freedom to discuss their work. Similarly, there should be no restriction on publication, except for any minor delay necessary for patenting. The university should not agree to any arrangements which will restrict the free communication of ideas. (ii) No ethically dubious obligations. Insofar as that may be compatible with their duties as charities to accept benefactions offered to them, the university should accept sponsorship for research or enter into partnership for research only with business entities whose area of operations is compatible with the university's core purposes (no tobacco money). (iii) No hidden connections. All authors of publications should acknowledge their funding sources and any direct business associations. The academics involved should report to their university all their involvements with organisations which have any connection with their professional work.

The report of the Canadian Association of University Teachers (CAUT) into the Olivieri affair made a series of recommendations for individuals and institutions involved in collaborative research [31]. In particular, the report insisted that universities and fund granting councils should have policies which prohibited contractual clauses restricting communication of risks identified in the projects concerned. If universities fail in this, the public interest and public safety are in jeopardy. The inclusion of public-fund-granting councils is important: they are powerful bodies which could give an example which others would find difficult to ignore.

Sir David Weatherall [3] emphasises how important is that "universities expose their PhD students and post-doctoral fellows to the principles of bioethics early on in their careers". He also commends the "increasing tendency for independent review panels to be established for clinical trials" and would like to see the establishment of an external body, such as a research council to act as a review body in the case of disagreement over publication. If adequately constituted and properly independent, such a review body could to some extent

counter the enormous power which large companies, with their huge financial and legal resources, can exert in disputes over research results.

Recently the editors of leading medical journals have introduced strong rules relating to declarations of conflict of interest which apply to all papers to be published in their journals [8, 32, 33]. These are intended to address the financial interest which authors or their sponsors may have in the implications of the research published, but also to insist that authorship means both accountability and independence. Authors should sign a declaration such as "I had full access to all of the data in this study and I take complete responsibility for the integrity of the data and the accuracy of the data analysis". These new requirements are a reaction to what the editors see as a situation in which corporate sponsors are able to dictate terms for collaboration which are not in the best interests of "academic investigators, the study participants, or the advancement of science generally". Like David Weatherall [3], we welcome this development as well as other signs that a number of leading science journals are moving in the same direction. Unfortunately the Royal Society of Chemistry appears not to see the need to follow suit [34].

John Wakeford, head of the Missenden Centre, a private institution concerned with the development of higher education, recently launched the Missenden code (devised by Rory Daly) to promote ethical research in British universities, at a seminar held at the House of Commons on 11 November 2002. The code urges universities to set up ethics committees to vet donations, sponsorship and funding, and to ensure that the source of money is acknowledged in publications [35]. It makes a particularly useful suggestion on the vexed question of limitation on freedom to publish results. It insists that "commercial considerations should never be allowed to prevent the publication of findings that are in the public interest or which add significantly to the body of knowledge in a field". Further in cases where some limitation on the freedom to publish is accepted, an explanatory note to this effect should be attached to the publication.

Some universities in the U.K. have already begun formally to address questions of ethics in research and of conflict of interest. Information relating to Oxford and Bath can be found in the references [36, 37]. Indeed a decade ago in the U.K the Committee of Vice Chancellors and Principles (now called "UUK") published a paper on sponsored research which recommended that "under no circumstances should the university allow the sponsor the right to delay publication for an unrestricted period of time."[38]. Unfortunately it seems to have been very reluctant actively to encourage universities to act on the recommendation.

Recently HEFCE, the government's English university funding council, has established the "Active Risk Management in Higher Education" project (ARMED) which aims to provide simple guidance to reduce legal risk in higher education institutions [39]. A code on Research Misconduct is among the procedures listed. It recommends introduction of detailed procedures designed to protect a university from legal liability, rather than to reinforce values of integrity and of academic freedom. However, in its interim document the definition of research misconduct includes "distortion of research outcomes, by distortion or omission of data that do not fit expected results, dishonest misinterpretation of results and publication of data known or believed to be false or misleading". If these terms persist through to final recommendations, their adoption by universities would provide a valuable counter to the all too common granting of complete control of publication to a corporate or governmental sponsor.

The problem of ensuring compliance

But the real problem is to find a way of ensuring compliance with any set of rules which may be devised. The industrial partner has to be brought to accept and adhere for its

part to any such code. The university has to be persuaded to consider it a nationally (or internationally) recognised set of norms, and the autonomy of universities may make that a difficulty in practice. One way of encouraging such habits of thought is for the Government to use "conditions of grant" sanctions and withhold public funding from institutions found out in bad practice. But that in its turn requires a political will which is not visible in the UK at the beginning of the second millennium.

The other way is to change the climate of expectation. That might be achieved by the setting up of a watchdog on standards in the commercial exploitation of academic science. That would require the political will, and a U-turn on the part of recent Governments, which have put first the putative saving to the public purse of getting private funding to do what otherwise would fall to the public funder, and have turned a blind eye to adverse consequences to the integrity and credibility of the resulting scientific findings. The climate was right in the 1990s to maintain a national Committee on Standards in Public Life. The climate has not been right to set up a Committee on Standards in the conduct of publicly-funded scientific research, perhaps because so much of it is now partly funded by industrial and commercial interests, and it has not been Government policy to discourage that by setting high hurdles of propriety in its administration. The suggestion that such a body be set up has been made, however, by Herbert Arst and Mark Caddick. They call for "the creation of an independent body dedicated to ensuring scientific integrity that would: have an enforceable set of rules; offer protection for those making accusations in good faith; have resources ad powers to conduct or oversee investigations; ensure that conclusions of misconduct are reported and acted upon" [40]. If, as they suggest "receipt of research funding, taking up a post in an academic institution, or the publication of work were dependent on acceptance of the authority of such a body, it would be possible for it to receive and impartially investigate complaints and act on any significant instance of misconduct", this would, in effect, restore the "buffer" thought essential to the protection of academic freedom and integrity during the twentieth. century. Some such requirement, (again perhaps backed by conditions of grant sanctions), would be essential in order to get universities to accept what might otherwise look like an intrusion on their autonomy. But this too would require Government will. Perhaps only a major disaster consequent upon the failure to police the integrity of research will create that will.

Conclusions

There are now so many documented examples of the corruption of scientific integrity that the public is rightly alarmed. A healthy scepticism about the claims in which there is vested interest is developing into an unhealthy cynicism towards all science. The problem is now widely recognised and there is no shortage of valuable suggestions for codes of conduct which, if adopted would do much to address the problem. The chief remaining difficulty is of "policing" and enforcement.

Useful things are happening, and need to be built on. Policies on declaration of interest adopted by leading medical journals need to be extended to all science and engineering journals. Professional bodies can put obligations on their members following leads by bodies such as the Canadian Medical Association. Individual universities (and universities collectively through advice from bodies such as the CVCP and the HEFCE-funded ARMED project) are introducing their own codes. Many in the US are ahead of the UK in this respect.

What is really needed, however, is firm commitment at government level to the principle of free publication. With this, government funding bodies, such as the research councils in the U.K., would follow suit, and universities would feel safe to adopt robust

protocols, without facing a disastrous loss of research funds. The instinct for secrecy is strong in government. This is certainly true in the UK, where gagging clauses in its own research contracts are every bit as bad as those used by industry [41] Perhaps public and professional concern is now at a level where government will act. However, if governments go down the path of opening up university teaching and research to private bodies under GATS regulations, things will get very much worse.

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